2^{nd} Quarter Key

Benchmark Post Test Review

Secondary Math 3H

Name ______________________________ **Date** ____________ **Period** ____________

Identify the intercepts of the function rounded to the nearest hundredth.

1. $f(x)=-3\sqrt{x+5}-1$

$\boxed{(0,-7.71) \quad \text{no x-int.}}$

y-int: $f(0) = -3\sqrt{0+5} - 1$
$= -3\sqrt{5} - 1 = -7.71$
(Look at graph.)

2. $f(x)=2\sqrt{3-x}+8$

$\boxed{\text{No x-int.}}$
(See graph)

y-int.: $\boxed{(0, 11.46)}$
$f(0) = 2\sqrt{3-0} + 8 = 11.46$

Identify the intervals where the function is increasing and decreasing.

3. $f(x)=x^3-3x^2+x-5$

graph Function:
increasing: $(-\infty, .18)(2.3, \infty)$
decreasing: $(1.8, 2.3)$

4. $f(x)=-2x^3+5x^2-2x+2$

graph function:
increasing: $(.23, 1.43)$
decreasing: $(-\infty, .23)(1.43, \infty)$

Determine the end behavior of each function using limits.

5. $f(x)=e^{x+2}-1$

graph function:
$\lim_{x\to\infty} f(x) = \infty$, $\lim_{x\to-\infty} f(x) = -1$

6. $f(x)=x^2+2x-7$

graph function
$\lim_{x\to\infty} f(x) = \infty$, $\lim_{x\to-\infty} f(x) = \infty$

Describe the transformations that have been applied to *f(x)* to create g(x) if:

7. $g(x)=f(x+2)-7$

horizontal shift left 2
vertical shift down 7

8. $g(x)=-5f(x-4)$

Horizontal shift right 4
vertical stretch by factor of 5
reflection across x-axis

Determine whether each function is even, odd or neither. Show work!

9. $f(x)=x^2+6$

$f(-x) = (-x)^2 + 6$
$= x^2 + 6$
same as $f(x)$
so even.

10. $f(x)=\frac{-1}{5}x^2+2x$

$f(-x) = \frac{-1}{5}(-x)^2 + (2)(-x)$
$= \frac{-1}{5}x^2 - 2x$
not same as $f(x)$
so check $-f(x)$.
$-f(x) = \frac{1}{5}x^2 - 2x$ not same as $f(x)$ so neither.

11. $f(x)=2x^3-7x$

$f(-x) = 2(-x)^3 - 7(-x)$
$= -2x^3 + 7x$
not same as $f(x)$ so
Check $-f(x)$.
$-f(x) = -2x^3 + 7x$
same as $f(x)$
so odd

Match each function with its graph.

12. $f(x) = -(x+3)^2 - 1$

c

13. $f(x) = (x-4)^2 + 2$

b

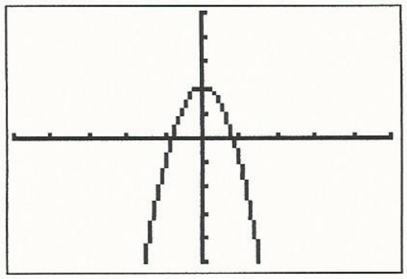
14. $f(x) = -3x^2 + 2$

a

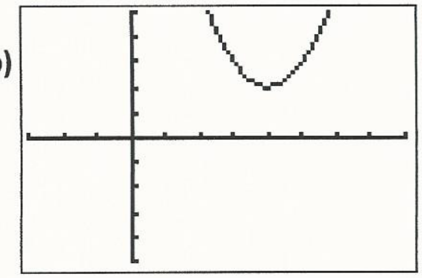
15. $f(x) = \frac{1}{2}x^2 - 4$

d

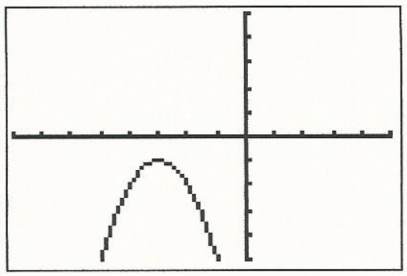
a)



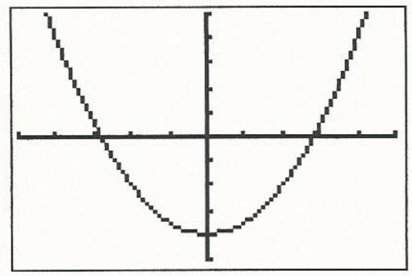
b)



c)



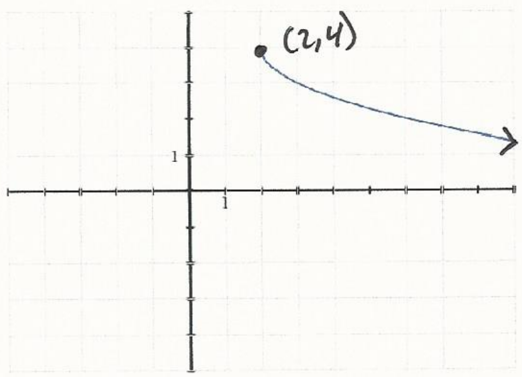
d)



Find the domain and range of each function graphed.

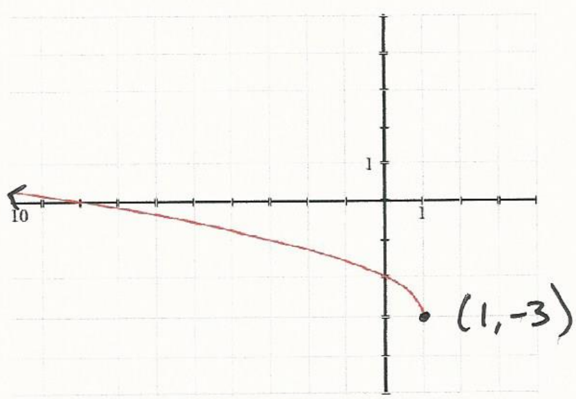
16. Domain $[2, \infty)$

Range $[4, -\infty)$



17. Domain $(-\infty, 1]$

Range $[-3, \infty)$



Find the average rate of change for each function on the specified interval. Show work!

18. $f(x) = -\sqrt[3]{15-x} + 4 \ on [-12, 7]$

$f(-12) = -\sqrt[3]{15+12} + 4 = -\sqrt[3]{27} + 4 = -3+4 = 1$

$f(7) = -\sqrt[3]{15-7} + 4 = -\sqrt[3]{8} + 4 = -2+4 = 2$

$\frac{2-1}{7+12} = \boxed{\frac{1}{19}}$

19. $f(x) = x^3 - 2x + 1 \ on \ [-1, 3]$

$f(-1) = (-1)^3 - 2(-1) + 1 = -1+2+1 = 2$

$f(3) = (3)^3 - 2(3) + 1 = 9-6+1 = 4$

$\frac{4-2}{3+1} = \frac{2}{4} = \boxed{\frac{1}{2}}$

20. **Find the average rate of change on the specified interval and interpret its meaning.**

The average high temperature per month in the city of South Jordan for the year 2012 is shown in the table below. Determine the average rate of change from September to December.

Month	Temp °F	Month	Temp °F
Jan	41	July	96
Feb	47	Aug	93
March	57	9 Sept	83
April	65	Oct	68
May	76	Nov	53
June	88	12 Dec	42

$\frac{42-83}{12-9} = \frac{-41}{3} \approx -13.67°$ per month.

Find the domain of each function.

21. $f(x) = \frac{x+2}{x-7}$

Domain: $(-\infty, 7) \cup (7, \infty)$

or $x \neq 7$

22. $f(x) = \frac{-3}{x^2-4}$

$(x+2)(x-2)$

Domain: $(-\infty, -2)(-2, 2)$
$(2, \infty)$

or $x \neq 2, x \neq -2$

23. $f(x) = \frac{x-8}{2x^2-7x-15}$

$(2x+3)(x-5)$

Domain: $(-\infty, -3/2)$
$(-3/2, 5)(5, \infty)$

or $x \neq -3/2$
$x \neq 5$

Solve for the specified variable.

24. $\frac{r_1}{r_2} = \sqrt{\frac{M_2}{M_1}}$, *solve for* M_2

$\left(\frac{r_1}{r_2}\right)^2 = \left(\sqrt{\frac{m_2}{m_1}}\right)^2$

$\frac{r_1^2}{r_2^2} = \frac{m_2}{m_1}$

$\frac{m_2 r_2^2}{r_2^2} = \frac{m_1 r_1^2}{r_2^2}$

$\boxed{m_2 = \frac{m_1 r_1^2}{r_2^2}}$

25. $\sqrt{b^2-4ac} = k$, *solve for c*

$\left(\sqrt{b^2-4ac}\right)^2 = (k)^2$

$b^2 - 4ac = k^2$
$-b^2 \qquad -b^2$

$\frac{-4ac}{-4a} = \frac{k^2-b^2}{-4a} \rightarrow \boxed{c = \frac{k^2-b^2}{-4a}}$

26. **Use a graphing calculator to determine when *f(x)* = g(x) if** $f(x) = \sqrt{x} - 2$ *and* $g(x) = -|x| + 5$.

(Round your answer to the nearest tenth.)

Find intersection(s) of two graphs.

Intersect at the point $\boxed{(4.8, .2)}$

For the sequence, write the rational equation that models the relationship between the term in the sequence and its value.

27. $\frac{-1}{2}, 0, \frac{1}{4}, \frac{2}{5}, \frac{1}{2}, \frac{4}{7}, \ldots$

term (n)	Value f(n)
1	$-\frac{1}{2}$
2	0
3	$\frac{1}{4}$
4	$\frac{2}{5}$
5	$\frac{1}{2} = \frac{3}{6}$
6	$\frac{4}{7} =$

$\boxed{f(n) = \frac{n-2}{n+1}}$

Solve each equation or inequality.

28. $\frac{x+2}{x^2-36} < 0$

$(x+6)(x-6)$

$-$ $\frac{(-)}{(-)(-)}$ | $+$ $\frac{(-)}{(+)(-)}$ | $-$ $\frac{(+)}{(+)(-)}$ | $+$ $\frac{(+)}{(+)(+)}$

$-6 \quad -2 \quad 0 \quad 6$

$\boxed{(-\infty, -6) \cup (-2, 6)}$

29. $\left(\frac{3}{x+6} + \frac{4}{x^2-36} = \frac{1}{x-6}\right)\frac{(x+6)(x-6)}{1}$ $\quad x \neq 6$ or -6

$3(x-6) + 4 = 1(x+6)$

$3x - 18 + 4 = x + 6$

$3x - 14 = x + 6$

$-x + 14 \quad -x + 14$

$2x = 20$

$\boxed{x = 10}$

30. $\frac{x-1}{x^2-5x+6} \geq 0$

$(x-3)(x-2)$

$-$ $\frac{(-)}{(-)(-)}$ | $+$ $\frac{(+)}{(-)(-)}$ | $-$ $\frac{(+)}{(-)(+)}$ | $+$ $\frac{(+)}{(+)(+)}$

$0 \quad 1 \quad 2 \quad 3$

$\boxed{[1, 2) \cup (3, \infty)}$

31. $\left(\frac{1}{x+4} + \frac{2}{(x+4)^2} = 1\right)\frac{(x+4)(x+4)}{1}$ $\quad x \neq -4$

$1(x+4) + 2 = (x+4)^2$

$x + 4 + 2 = x^2 + 4x + 4x + 16$

$x + 6 = x^2 + 8x + 16$

$-x - 6 \quad -x - 6$

$0 = x^2 + 7x + 10$

$0 = (x+5)(x+2)$

$\boxed{x = -5, \; x = -2}$

Use the following functions for 31 – 34 $f(x) = x^2 + 3$ *and* $g(x) = -3x - 4$, **to find the algebraic expression for *h(x)*.**

32. $h(x) = (f-g)(x) = f(x) - g(x)$

$= (x^2+3) - (-3x-4)$

$= x^2 + 3 + 3x + 4$

$= \boxed{x^2 + 3x + 1}$

33. $h(x) = (fg)(x) = f(x) \cdot g(x)$

$= (x^2+3)(-3x-4)$

$= \boxed{-3x^3 - 4x^2 - 9x - 12}$

34. *Evaluate*: $f(-2) \cdot (g)(1)$

$f(-2) = (-2)^2 + 3 = 4 + 3 = 7$

$g(1) = -3(1) - 4 = -3 - 4 = -7$

$f(-2) \cdot g(1) = 7 \cdot (-7) = \boxed{-49}$

35. *Evaluate*: $f(0) \cdot (g)(\pi)$

$f(0) = 0^2 + 3 = 3$

$g(\pi) = -3\pi - 4$

$f(0) \cdot g(\pi) = 3(-3\pi - 4)$

$\boxed{= -9\pi - 12}$

Find the inverse of each function.

36. $f(x) = -2\sqrt{x-5}$

$\frac{x}{-2} = \frac{-2\sqrt{y-5}}{-2}$

$\left(\frac{x}{-2}\right)^2 = \left(\sqrt{y-5}\right)^2$

$\frac{x^2}{4} = y - 5$

$\frac{x^2}{4} + 5 = y$

Domain $[5, \infty)$

37. $f(x) = \frac{\sqrt{x+3}}{6}$

$6 \cdot x = \frac{\sqrt{y+3}}{6} \cdot 6$

$(6x)^2 = \left(\sqrt{y+3}\right)^2$

$36x^2 = y + 3$

$y = 36x^2 - 3$

Domain $[-3, \infty)$

38. $g(x) = -3x + 7$

$x = -3y + 7$

$\frac{x-7}{-3} = \frac{-3y}{-3}$

$\boxed{g^{-1}(x) = \frac{-x+7}{3}}$

39. $g(x) = 5x - 2$

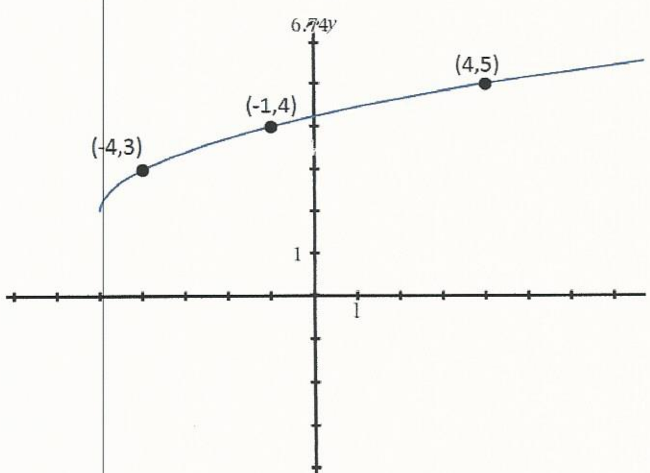
$x = 5y - 2$

$\frac{x+2}{5} = \frac{5y}{5}$

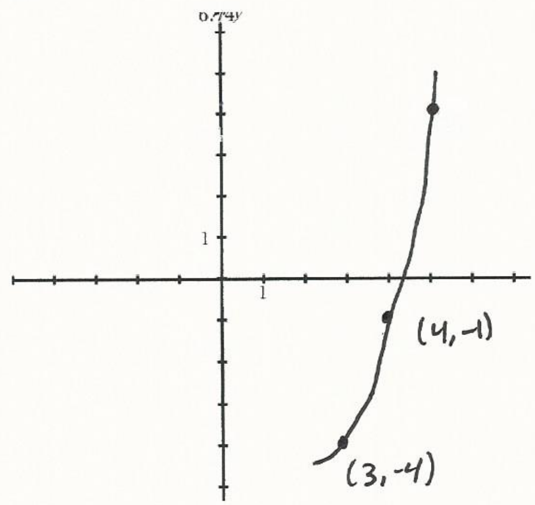
$\boxed{g^{-1}(x) = \frac{x+2}{5}}$

40. Use the graph of *f(x)* to draw its inverse *f*$^{-1}$*(x)* on the graph provided.

f(x)

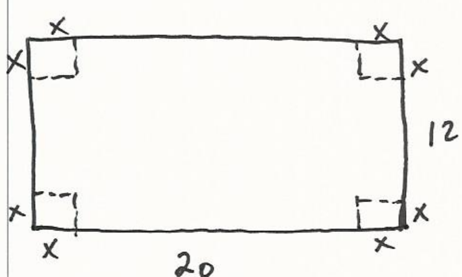


f^{-1}*(x)*



41. A box is to be made from a 20 inch by 12 inch piece of cardboard by cutting identical squares from each corner and folding up the sides.

a) Draw and label a model of this problem.



b) Write a function for the volume of the box.

$V(x) = x(20-2x)(12-2x)$

c) Give the domain of the function in context of the problem.

$(0, 6)$

d) Give one dimension that the corner squares could have and find the volume for the box with that dimension.

multiple answers here:

1 in → 180 in^3

2 in → 256 in^3

3 in → 252 in^3

4 in → 192 in^3

5 in → 100 in^3

x	V(x)
1	180
2	256
3	252
4	192
5	100

e) Use technology (graphing calculator) to find the maximum volume the box can have. Give the dimensions (length, width, and height) of the box and the maximum volume, both to the nearest tenth of an inch.

max volume: 262.68 in^3

height: 2.43 in

length: $20 - 2(2.43) = 15.14$ in

width: $12 - 2(2.43) = 7.14$ in